

M30143US(L)
Minebea Co., Ltd.

Amended patent claims (Rule 19 PCT)

1. A method for the manufacture of an electric motor for a hard disk drive comprising a stator (15), a rotor (11), a shaft (35) and a hydrodynamic bearing arrangement (13) which rotatably supports the rotor (11) with respect to the stator (15), characterized in that
 - a) a bearing sleeve (37) of the hydrodynamic bearing arrangement (13) is manufactured;
 - b) an axial ring (47) is fixed to one end of the shaft (35);
 - c) the shaft (35) is inserted together with the axial ring (47) into bearing sleeve (37);
 - d) one end of the bearing sleeve (37) is sealed with a counter disk (41);
 - e) bearing fluid is inserted into a bearing gap between the shaft (35) and the bearing sleeve (37); and
 - f) the assembly (49) consisting of the shaft (35) and the bearing arrangement (13) is tested before it is installed in the spindle motor.
2. A method according to claim 1, characterized in that the shaft (35) is connected to a rotating component (11) of the spindle motor before the assembly is tested.
3. A method according to claim 2, characterized in that the rotating component is the rotor (11) of the spindle motor.
4. A method according to claim 1 or 2, characterized in that the prefabricated bearing arrangement (13) is bonded to the rotating component.

5. A method according to claim 4, c h a r a c t e r i z e d in that an adhesive with low gas emission properties is used.
6. A method according to one of the above claims, c h a r a c t e r i z e d in that during manufacture of the bearing sleeve (37), the inner bearing surface (38) of the bearing sleeve (37) is provided with a groove pattern (40).
7. A method according to one of the above claims, c h a r a c t e r i z e d in that a transition fit is provided at a fixed assembly section between the bearing arrangement (13) and the stator (15) or the rotor (11).
8. A method according to one of the above claims, c h a r a c t e r i z e d in that the bearing sleeve (37) is fixedly mounted onto the stator (15).
9. A method according to one of the above claims, c h a r a c t e r i z e d in that a hub (31) of the rotor (11) is fixedly connected to the shaft (35), with a unit consisting of rotor hub (31), shaft (35) and bearing sleeve (37) then being mounted with respect to the stator (15).
10. A spindle motor for a hard disk drive comprising a rotor (11), a stator (15), a shaft (35) and a hydrodynamic bearing arrangement (13) that rotatably supports the rotor (11) with respect to the stator (15), the hydrodynamic bearing arrangement having a bearing sleeve (37) on whose inner surface (38) a groove pattern (40) is formed in order to create a hydrodynamic radial bearing, an axial ring (47) being mounted onto the shaft (35) to create a hydrodynamic axial bearing, the shaft (35) being inserted into the bearing sleeve (37), one end of the bearing sleeve (37) being sealed with a counter disk (41), bearing fluid being inserted into the bearing gap between the shaft (35) and the bearing sleeve (37), and the hydrodynamic bearing arrangement (13) thus produced forming a fully functional unit that can be tested before being mounted onto the rotor (11) or the stator (15) of the spindle motor .

11. A spindle motor according to claim 10, characterized in that the stator (15) or the rotor (11) is firmly fixed to the outer surface of the bearing sleeve (37).
12. A spindle motor according to claim 10 or 11, characterized in that the shaft (35) is inserted into the bearing sleeve (37) before the bearing arrangement is mounted onto the stator (15) or the rotor (11).
13. A spindle motor according to one of the claims 10 to 12, characterized in that a transition fit is provided between the bearing arrangement (13) and the stator (15) or the rotor (11).
14. A spindle motor according to one of the claims 10 to 13, characterized in that the hydrodynamic bearing arrangement 13 is fixedly connected to the rotor (11) or the stator (15).
15. A spindle motor according to claim 14, characterized in that a groove (55) is provided on at least one of the bonded contact surfaces of either the bearing arrangement (13) or the stator (15) or the rotor (11).
16. A hard disk drive having a spindle motor according to one of the claims 10 to 15.
17. A hydrodynamic bearing arrangement for an electric motor, particularly for a spindle motor for a hard disk drive, comprising a stator (15), a rotor (11), a shaft (35) and the hydrodynamic bearing arrangement (13), which rotatably supports the rotor with respect to the stator, the hydrodynamic bearing arrangement (13) having a bearing sleeve (37), an axial ring (47) being mounted onto one end of the shaft (35) and the shaft (35) being inserted into the bearing sleeve (37); the corresponding end of the bearing sleeve (37) being sealed with a counter disk (41); bearing fluid being inserted into the bearing gap between the shaft (35) and the bearing sleeve (37), and the unit thus formed from the hydrodynamic bearing arrangement (13) and the shaft (35) forming a fully functional unit that can be tested and mounted onto the stator (15) or the rotor (11).